Investigating EMFs and Pesticides in Clarendon, VT

An ES 401 partnership with Clarendon F.I.R.S.T.

Clarendon
F.I.R.S.T
Families Interested In Researching Sickness Together

Middlebury College
Environmental Studies Senior Seminar (ES 401)
Spring 2004

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Introduction

E.S. 401: The Senior Seminar

Environmental Studies 401, the required senior seminar, is the culmination for all ES majors. It is designed to bring the core Environmental courses and multiple individual foci together in a meaningful way through a service-learning project. As a result, students are able to integrate and apply the knowledge gained in over four years of study towards helping a local problem. Each semester the seminar has a different focus; this semester's focus was pollution. Four organizations were identified as our community partners, and groups of five students worked closely with each non-profit environmental organization. As well as being a powerful learning experience for us as students, the projects were designed to be beneficial to the community.

Clarendon F.I.R.S.T.

Clarendon F.I.R.S.T., (Families Interested in Researching Sickness Together), was founded by Jackie Fenner and Wanda Crossman to investigate a perceived high incidence of cancer in their community of Clarendon, Vermont. According to the National Cancer Institute, each year 1-2 out of 10,000 children develop leukemia nationally (National Academy of Sciences, 1996). The town of Clarendon appears to exceed this average with 3 cases of Acute Lymphoblastic Leukemia (ALL), in a population of 2,900. Clarendon F.I.R.S.T. believes that there is an underlying environmental cause for the high rate of cancer and, since the inception of the group in March 2003, they have been working to ascertain potential carcinogens in the community.

Middlebury College's relationship with Clarendon F.I.R.S.T. began in the Fall of 2003 as students from ES 401 worked on a variety of projects designed to investigate the health of the Clarendon community, most importantly by distributing health surveys to community members. These comprehensive surveys were developed by Dick Clapp, an epidemiologist from Boston University, who is assisting Clarendon F.I.R.S.T. in their investigation. The surveys detailed the familial health history and reproductive history of each individual, as well as past working conditions, residences, and alcohol or tobacco use. The survey was designed to separate the genetic and lifestyle causes of cancer from environmental causes. Approximately 500 surveys (of the desired 1,500) were returned and coded so the data could be used for statistical analysis.

In addition to coding, the 2003 class created Geographic Information Systems (G.I.S.) maps that indicate area slope and soil composition and thus potential routes of water contamination. After concluding that there is a greater potential for ground water contamination than surface water contamination, the group suggested that future studies include well testing. Following extensive well and water testing, Bruce Tease, an environmental analyst working with Clarendon F.I.R.S.T., has determined that water contamination is not a probable cause of the cancers in Clarendon. As a result, the organization has turned their focus to other potentially harmful sources, specifically towards Electromagnetic Fields (EMFs) and agricultural pesticide use. Clarendon F.I.R.S.T. requested that our group assist in the investigation of these potential causes of cancer.

Electromagnetic Fields

Investigating Clarendon EMFs

In our initial meeting with the organizers of Clarendon F.I.R.S.T., concern was expressed over the possible connection between incidence of cancer in their community and EMFs. As a high-voltage power line runs through the town, possibly producing EMFs at high levels, Clarendon F.I.R.S.T. wanted us to measure and map EMF levels throughout the town. Before designing and proceeding with our study, we first conducted a thorough literature review to research the health effects of EMFs and study protocol for their measurement established in peer-reviewed journals. A summary of these journal findings follows and will hopefully be a useful tool for the group.

EMF Literature Review

Produced by power lines, electrical wiring, and electrical equipment, extremely low frequency electric and magnetic fields (EMFs) have been subject to an onslaught of questions regarding their risk to human health in the past several decades. EMFs occur wherever electricity is being used; virtually everyone in our society is exposed to them. Since they can pass through all materials, research has focused on the potential health and biological effects of magnetic fields. Of particular concern are magnetic fields associated with 60-hertz alternating current (AC) electric power that varies with time, rather than direct currents (DC) that do not (US EPA, 1992).

EMFs are commonly misconceived to be responsible for a number of illnesses and ailments: numerous types of cancer, birth defects, miscarriages, chronic fatigue syndrome, Alzheimer's disease, and allergies, among others. There is even an EMF-

specific disorder called ‘electromagnetic-hypersensitivity syndrome’ or ‘electrical sensitivity’ (Mitchell and Cambrosio, 1997). The perceived threat of EMFs stems from a report on epidemiological studies from the Soviet Union and experimental studies conducted in the United States in the early 1970s, both showing biological effects from low frequency EMFs (Wertheimer and Leeper, 1979). Three years after this article, the same researchers published a report linking magnetic fields and adult cancer (Wertheimer and Leeper, 1982). Weakly positive or equivocal results have been reported in several further studies, thus perpetuating concern over EMFs. However, most studies since Wertheimer and Leeper (1982) have produced conflicting results. In regards to research on acute lymphoblastic leukemia (ALL), a disease of particular concern in Clarendon, there is little evidence that homes with high levels of magnetic fields have an increased incidence of ALL in children (Linet et al., 1997). After reviewing epidemiological literature, the National Institute of Environmental Health Sciences found that the evidence linking EMFs and cancer is weak (NIEHS 2001). Furthermore, reports by the National Academy of Sciences (1996) and the National Cancer Institute (Linet et al.,1997) concluded that there is no clear, convincing evidence that exposure to electric power lines and electric appliances are a threat to human health at the exposure levels typically found in homes.

With the exception of a few out-of-court settlements, which have produced no jurisprudence on damages for cancers allegedly caused by EMFs, all EMF cases reaching the courts have been unsuccessful. While largely due to the lack of evidence correlating cancer and other heath problems with EMF exposure, the research conducted on EMF levels is unstandardized and easily undermined in the courts. For

example, the tools utilized for the measurement of EMF levels, known as dosimeters, measure electric fields and magnetic fields seperately, not 'EMFs' per se, in terms of specific levels of intensity or strength described in milliGauss or kiloVolts. The accuracy of these measuring devices has itself become the topic of controversy, even as the controversy surrounding EMFs and their health implications has not been resolved. In epidemiological studies, EMF risk depends on the measurement of EMFs, as well as the mapping of exposure to EMFs by the incidence of particular pathologies in space and time. The mapping of the EMF environment, however, is largely unregulated and unstandardized as well. Furthermore, there is no agreement about how to interpret the significance of the measurement provided by the dosimeter in such studies (Mitchell and Cambrosio 1997).

Magnetic Fields for Common Appliances (in milligauss)

Appliance	Distance from Person: 6 inches	Distance from Person: 1 foot
Hair dryer		
highest	700	70
lowest	1	ND
Dishwasher		
highest	100	30
lowest	10	6
Iron		
highest	20	3
lowest	6	1
Vacuum cleaner		
highest	700	200
lowest	100	20
Copy machine		
highest	200	40
lowest	4	2
Color TV		
highest	20	8
lowest	ND	ND
Window AC		
highest	20	6
lowest	ND	ND
Computer monitor		
highest	20	6
lowest	7	2

Table 1. EMF levels (in milligauss) of common household appliances (NIEHS 1995)

Methods

Our goal in conducting a survey of EMF levels in the town of Clarendon was to identify and map regions of elevated EMF radiation for further investigation. As EMF levels change over a resolution on the order of inches, the range is too small to feasibly conduct a comprehensive survey of a 36 square mile town. Furthermore, in order for elevated EMF levels to affect a population, they would need to be elevated over a substantial sized area. Due to these limitations, we surveyed the town by driving along main roads and stopping every 0.1 miles to measure EMF levels in milligauss, using a dosimeter. At each point, we also recorded the Global Positioning System (GPS) position using a Garmin GPS unit. GPS locations were recorded from inside the car, while guass readings were taken from outside the car and along the side of the road. The data were collected over a period of four afternoons in March and April.

This survey was in no way comprehensive; there is still no data for much of the town and the areas that were surveyed represent a strong bias towards roadways and the northeastern portion of the town. However, the area surveyed contains the highest density of residences in Clarendon. Furthermore, it is necessary to recognize that there may be inaccuracies in measurement of both the GPS unit and the dosimeter that may skew the data. Despite these potential shortcomings, the data collected can still be valuable in providing a general overview of EMFs within Clarendon and for identifying areas for concern or further study.

Results

The EMF levels detected in Clarendon ranged from 0.0 to 22.5 milligauss. While the federal government has not set any safety standards regarding EMF exposure, all the levels we encountered were well below those emitted by many common household appliances, as listed in the table of Magnetic Fields for Common Household Appliances (Table 1). The data presented in Map 1 are classified into five categories based on natural breaks (Figure 1), symbolized with different colored and sized dots. Lighter yellow colored dots represent lower EMF levels and larger red dots represent higher readings. In general, the map of EMF data shows that baseline levels of EMFs are low and that all are lower than the levels of standard household appliances (NIEHS 1995).

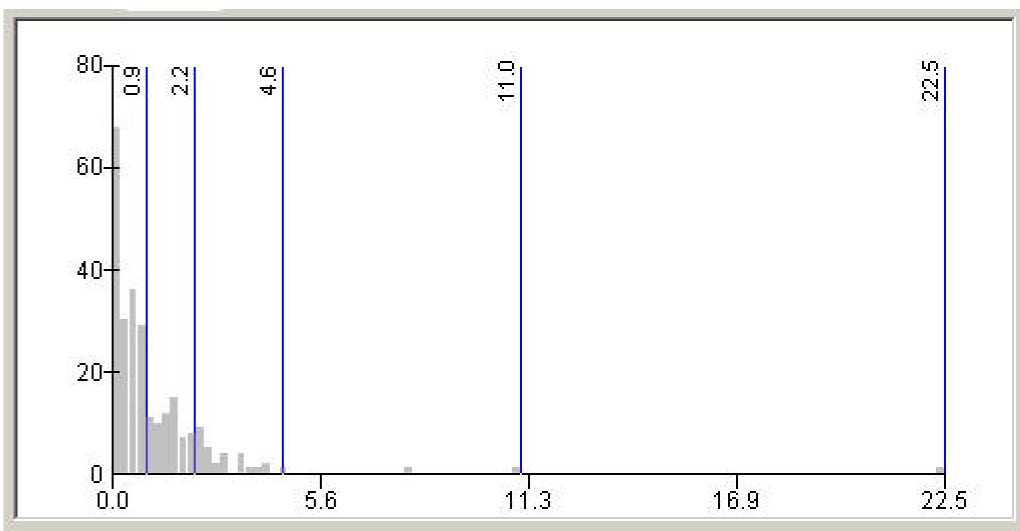
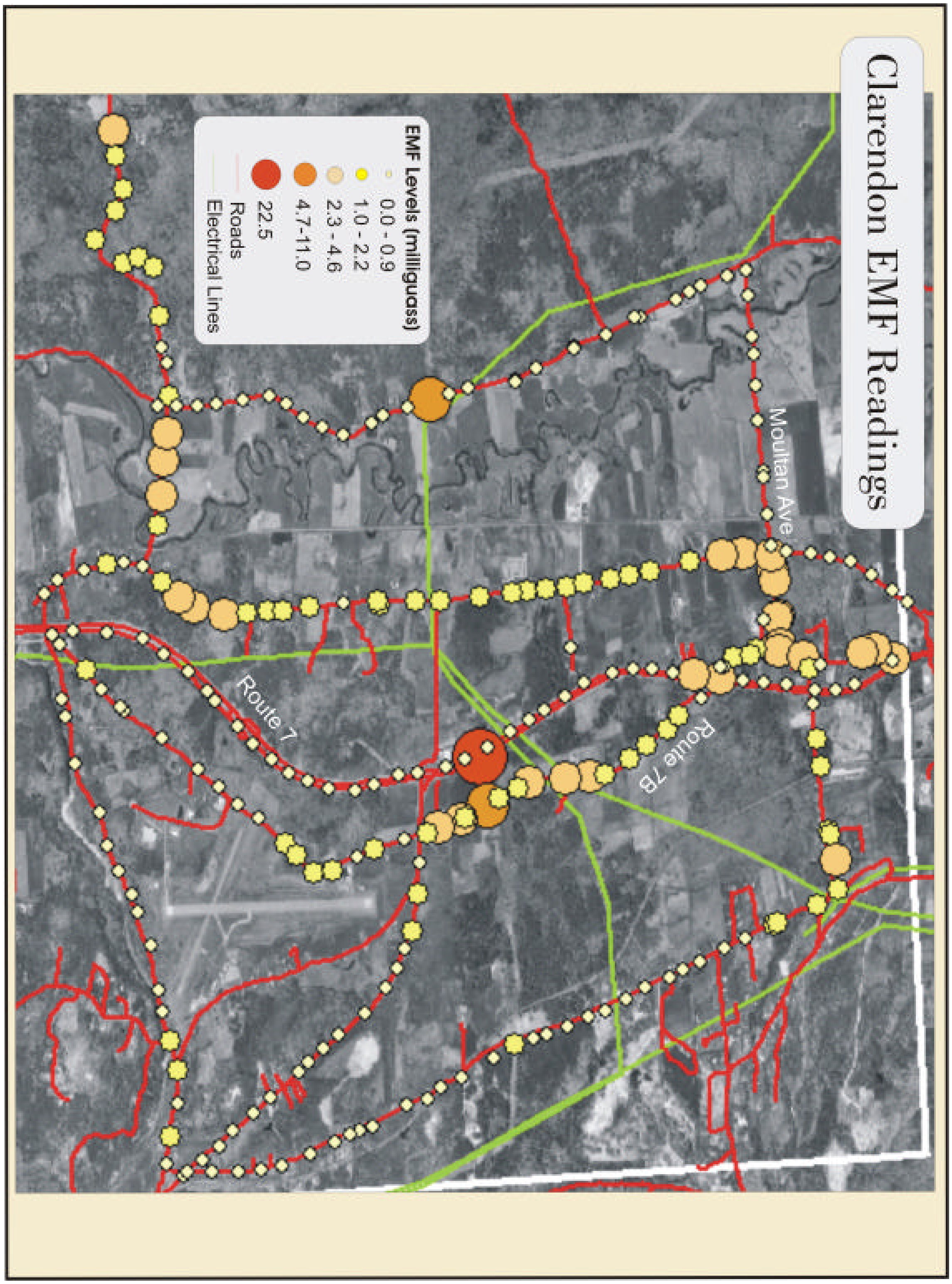


Figure 1. Data Histogram Depicting Natural Breaks

Map 1



Note: 0.0 – 0.9 readings indicated by small yellow diamonds; 1.0 – 2.2 readings indicated by rough-edged yellow circles; all other readings are as indicated in map key.

Discussion

Although the data cannot be statistically analyzed, an attempt can still be made to explain the data and to identify avenues for further investigation. While we cannot determine whether the heightened EMF readings along Moltan Avenue and Route 7B (Map 1) are significant, there are a number of factors that may offer some explanation for the cause of higher readings. There is a smaller row of power lines which runs along the side of the street which are not presented on the map which may result in higher EMF readings. In addition, Route 7B and Moltan Avenue have a greater population, possible indicating a greater amount of electrical appliance use.

As shown on Map 1, there are also elevated levels of EMFs on Route 7 and Route 7B, where the major power line networks cross over the roads. However, EMFs have a very limited range. As our data indicate, EMFs are noticeably elevated directly below power lines, but drop to lower levels within relatively short distances from these lines.

The possibility remains that a more comprehensive study of Clarendon EMFs might further reveal areas of significantly elevated radiation levels. However, with such weak epidemiological evidence to link cancer and EMFs, further investigation is unlikely to shed more light on EMFs as a potential cancer source in the town of Clarendon.

Pesticides

Human Health and Pesticides

The potential health effects of pesticide exposure include acute poisoning, cancer, neurological effects and reproductive and developmental harm. Effects are often not immediate, showing up years later as unexplained illness (Pesticides and Human Health 2002). Children are much more likely to suffer from pesticide exposure for several reasons: they ingest more food and water for their body weight, they breathe more frequently, and they crawl on the ground and put their hands in their mouths.

According a wide variety of sources, such as the National Cancer Institute and the American Cancer Society, the use of pesticides has been linked to a higher risk of developing various cancers, non-Hodgkin's lymphomas, and leukemia amongst farmers. One study finds that children whose homes and gardens are treated with pesticides have 6.5 times greater risk of leukemia than children living in untreated environments (La Rue 2002).

Agricultural pesticide dispersal may be of concern since much of the land in Clarendon is managed for agricultural purposes (Maps 2 & 3). While we were unable to obtain a list of all agricultural pesticides used in the town limits (Appendix A), we were able to research background information concerning those likely used in Clarendon. The following pages discuss these pesticides, in addition to other commonly used agricultural pesticides, with a focus on their potential threat to human health. In order to truly understand the pesticide situation, it would be necessary to have a detailed historical listing of the pesticides used in the area, times, and amounts of spraying, where the pesticides were used, water sampling, wind information and an understanding of the local

soil chemistry. Information can be found on the ability of each different pesticide to break down depending upon the soil type and composition where it is sprayed; however, this information is relatively useless until a spatial representation of pesticide use is available.

Aldrin and Dieldrin

Aldrin and Dieldrin were used as pesticides for crops from the 1950s until banned by the EPA in 1974, except to control termites, and then later banned completely in 1987. Sunlight changes aldrin to dieldrin, as do plants and animals within their bodies. Dieldrin binds to soil and breaks down very slowly. Therefore, dieldrin is everywhere in the environment at low levels. Locations near waste sites may contain higher levels of dieldrin, as do homes that have been treated for termites (ATSDR 2003).

The EPA limits the amount in drinking water to 0.001mg/L aldrin and 0.002 mg/L dieldrin. This restriction is thought to limit the lifetime risk of developing cancer from the low level exposure to 1 in 10,000. The Occupational Safety and Health Administration set a max of 0.25mg/m^3 of air in the workplace for both compounds. The FDA limits the residue of these compounds in raw foods to a range of 0 to 0.1 ppm depending on the type of food (ATSDR 2003).

Although both compounds have been shown to cause cancer in mice, there is inconclusive evidence that they serve as human carcinogens. However, studies have been conducted with more conclusive results as to other health effects. Ingestion has been shown to cause convulsions and possible death. Long-term moderate exposure causes headaches, dizziness, vomiting and uncontrolled muscle movements that stop when

removed from the exposure. There is a decreased ability of animals to fight off infections after low-level long-term exposure, although the study has not been done on humans. Dieldrin has also been found both in human breast milk and fatty tissue, indicating that it is passed on to infants. The health effects of its presence in breast milk and fatty tissue are unknown (ATSDR 2003).

Arsenic

While inorganic arsenic is more toxic than organic forms of arsenic, there is almost no information on the effects of organic arsenic on humans. Inorganic arsenic is a proven human carcinogen (EPA). Most arsenic today is used to coat wood, called pressure-treating. Organic arsenic is still used as an herbicide. In the past inorganic arsenic was used as a pesticide and to treat acute promyelocytic leukemia (APL). If used as an herbicide, arsenic can enter the body via ingestion or inhalation. However, it usually leaves the body relatively quickly. According to the EPA the maximum contaminant level for arsenic in drinking water is 0.01 mg/L (EPA 2003a).

Atrazine

Atrazine is the most heavily used herbicide in the United States, with between 75 and 85 million pounds of the chemical produced each year (EPA 2003b). 86% of the 76.5 million pounds applied annually is used on cornfields with an additional 10% applied to sorghum and 3% to sugar cane plantations. The remaining 1% is divided amongst guava, macadamia nut, wheat, Christmas tree operations, hay fields, pasture, and as an applicant

for lawns in the southeastern United States. Over 75% of corn acreage in the US undergoes atrazine application (Snedeker 1999; EPA 2002).

Atrazine is generally applied after establishment of the target crop and inhibits photosynthesis (and, thus, colonization) of undesirable weed seedlings. Its relationship with wheat is an exception, as it is then applied on fallow land following the most recent harvest. Because application procedures can include a variety of sprayers (groundboom, rights-of-way, hand-held, backpack, push-type and lawn handgun) as well as via aircraft or tractor-drawn spreaders, atrazine inevitably becomes airborne and disperses beyond its immediate target area (EPA 2002). As much as 14% of a single application can be volatized in air and be carried via water vapor or dust particles up to 186 miles away (ATSDR 2003). It then settles in surface waters or soils. Atrazine generally has a half-life of 3.3 months in most soils with 90% of its former volume disintegrated after a year. This can vary depending on the soil characteristics. Soils with higher hydraulic conductivities that are less absorptive allow for greater mobility and may not maintain high levels of the chemical (ATSDR 2003). However, clay soils or those high in organic matter allow less percolation and might enhance surface runoff of contaminated water. Overall, atrazine remains in the upper 1 to 12 inches of soil (Baumann and Ketchersid 1998).

The EPA has set a maximum contaminate level (MCL) of 3.0 ppm for atrazine exposure (EPA 2004). It is unlikely that such a limit would be encountered in the environment and even if one ingested atrazine at its MCL every day for his or her entire life, chronic levels still wouldn't be reached. To put the chemical into perspective, acute dosages of caffeine and aspirin, respectively, are 192 and 1750 ppm while one for atrazine is 3,090 ppm. One would have to drink 9 million gallons of water with an

atrazine concentration level of 3.0 ppm in one day to reach acute levels (Bauman and Ketchersid 1998).

Researchers and the EPA have agreed that no evidence of atrazine influencing cancer in humans exists. It may instigate cancerous mammary tumors and cause hormonal imbalances effecting reproductive and developmental processes in lab animals, but these results have been species specific and unrelated to humans. After refining its risk assessment for atrazine in 2002, the EPA subsequently labeled it to be “not a likely human carcinogen” (Snedeker 1999; EPA 2003a). The EPA also finds no risk of contamination in food produced from crops grown with atrazine or in drinking water. Risk of possible incurred health effects are now limited to individuals (especially children) who interact on a wet lawn immediately following application of atrazine (primarily through hand to mouth ingestion or direct ingestion of pellets), workers who handle large amounts of atrazine for extended periods of time, and laborers scouting sugar cane plantations immediately following application. Ecological effects include changes in primary productivity of aquatic ecosystems, including the health of aquatic invertebrates, fish and frogs at levels greater than 10-20 ppb (EPA 2002).

Benz[a]anthracene

Benzanthracene, found in some pesticides, is a Group B2 carcinogen or a probable human carcinogen. Benz[a]anthracene is adsorbed to soil particulates where it undergoes degradation by microorganisms. It can persist in the soil from days to years depending on the adsorbent and the microorganisms present (ATSDR, 2003).

DDT/DDE

DDT is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDE is a metabolite of DDT which was banned in the US in 1972. DDE is usually found in small amounts in food and can accumulate in fatty tissue; infants can be exposed through their mother's breast milk which has higher concentrations than fatty tissue. No studies are available on the acute or chronic effects of DDE in humans. The link between DDE and cancer in humans in inconclusive. The EPA has classified DDE as a group B2, a probable human carcinogen (ATSDR 2003).

Flumetsulam

Flumetsulam is US EPA registered herbicide manufactured by Dow Agro for use on corn and soybean. There is very little toxicological data available for this product. While this chemical is not believed to be carcinogenic, chronic exposure to high levels of flumetsulam resulted in reduced weight and inflammatory and atrophic changes in the kidneys in animal studies. Flumetsulam is also highly toxic to fish and zooplankton (Fluoride Action Network 2003).

Pendamethalin

Pendamethalin is an herbicide used to kill annual grasses and weeds in corn, potato, rice, cotton, soybean, tobacco, peanut and sunflower fields, as well as on residential lawns. It is applied via an orange-yellow colored crystal or as a liquid before the emergence of first sprouts and briefly at post-emergence (U.S. EPA Pendimethalin Web Page; EXTOXNET 1996).

Exposure is limited to direct contact through the skin or breathing or in small amounts when eating contaminated food, although it is virtually non-toxic via these vectors. While pendamethalin products may cause irritation of the mouth, nose, throats or lungs, there is little or no evidence of it being an acute or chronic toxin. Exposures through diet are low and only increase in risk from long-term direct handling exposure in production facilities or in application areas. It is not carcinogenic or mutagenic and is unlikely to affect the reproductively of humans. It is slightly toxic to birds and highly toxic to fish and aquatic invertebrates. In one study, female rats exposed to pendimethalin suffered thyroid problems (U.S. EPA Pendimethalin Web Page; EXTOXNET 1996).

Pendimethalin has a half-life of 40 days and is insoluble in water, posing little risk for contamination of groundwater aquifers. The EPA has not established a MCL for pendimethalin, but the Vermont Department of Health has established an advisory limit of 280 ppb. At this level there is a one in a million risk of suffering adverse health effects from exposure (U.S. EPA Pendimethalin Web Page; EXTOXNET 1996).

Pesticide Volatilization

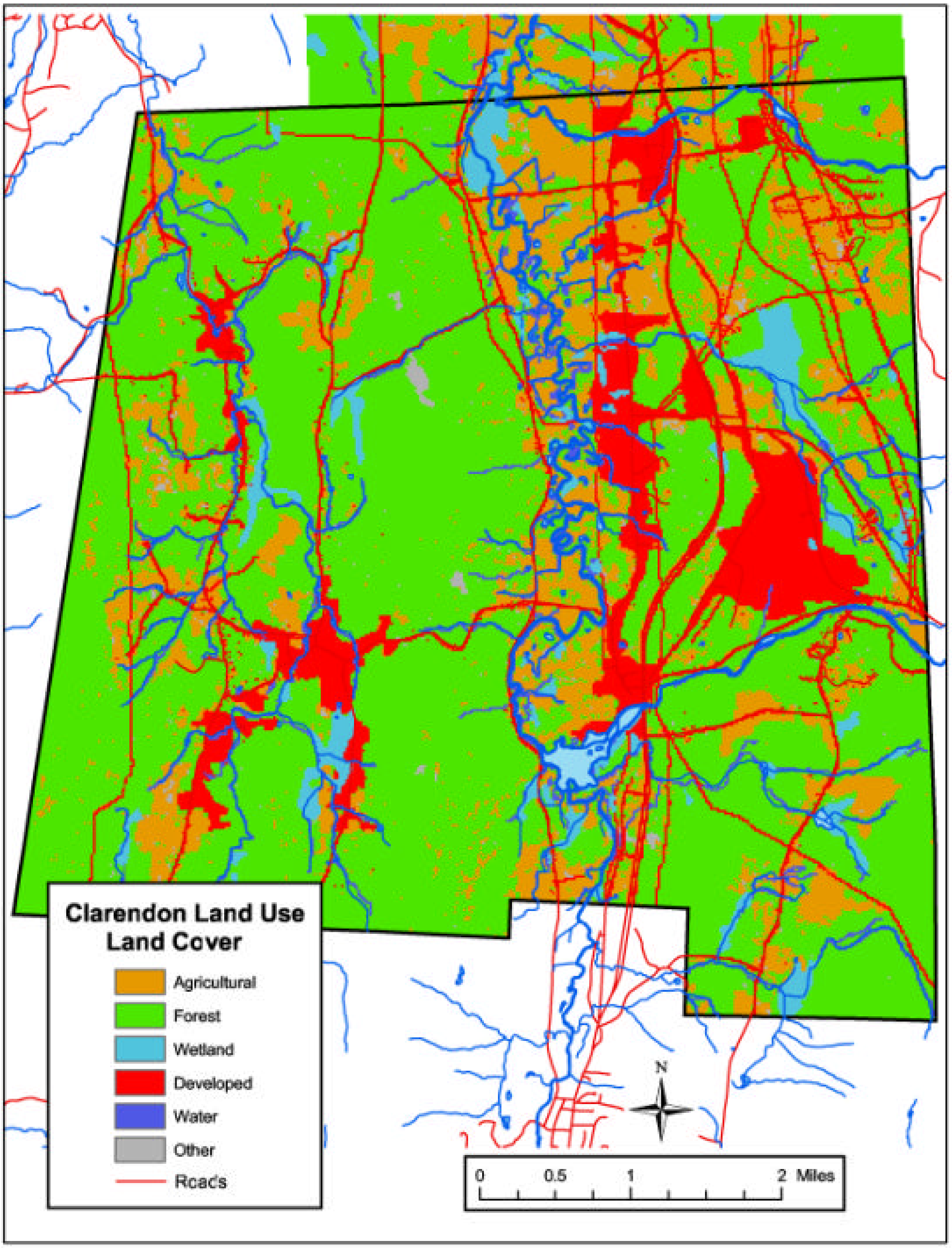
The amount of time pesticides remain in the environment is related to properties of both the soil and the pesticide. Individual pesticide properties such as acidity and water solubility influence the extent to which pesticides bind to soil particles. For instance, atrazine is highly persistent in soils and disperses via hydrolosis, rarely binding to soil particles, whereas pendimethalin volatilizes easily, rarely dissolving in water and instead binding to soil molecules (EXTOXNET 1996a;b). Clay, et al. (2000) found that atrazine lingered in clayey or loamy soils twice as long as in sandy soils. Atrazine’s half life in sandy soils was 21 days compared to 45 for clay/loam soils.

The likelihood of volatilization occurring rises as a pesticide's concentration increases to maximum saturation in moist soils (White 1997). Therefore, saturated soils are more likely to volatilize water soluble pesticides. Pesticides that bind easily to soil particles are less likely to volatilize through water vapor but could disperse by wind when soils are dry. In order to predict probable areas of volitilization, soils described in the Rutland County Soil Survey (Ferguson 1998) were classified by their drainage potential: very poorly drained (VPD), poorly drained (PD), moderately well drained (MWD), well drained (WD), and excessively well drained (EWD). By intersecting Rutland soils with areas designated as agriculture in the Vermont Land Use Land Cover (LULC) data, agricultural soils and their volitilization properties (using drainage potential as a proxy) can be spatially represented (Map 4). Those soils that are poorly drained are more likely to volitilize water soluble pesticides via water vapor while well drained soils may dry and disperse soil bound pesticides in heavy winds.

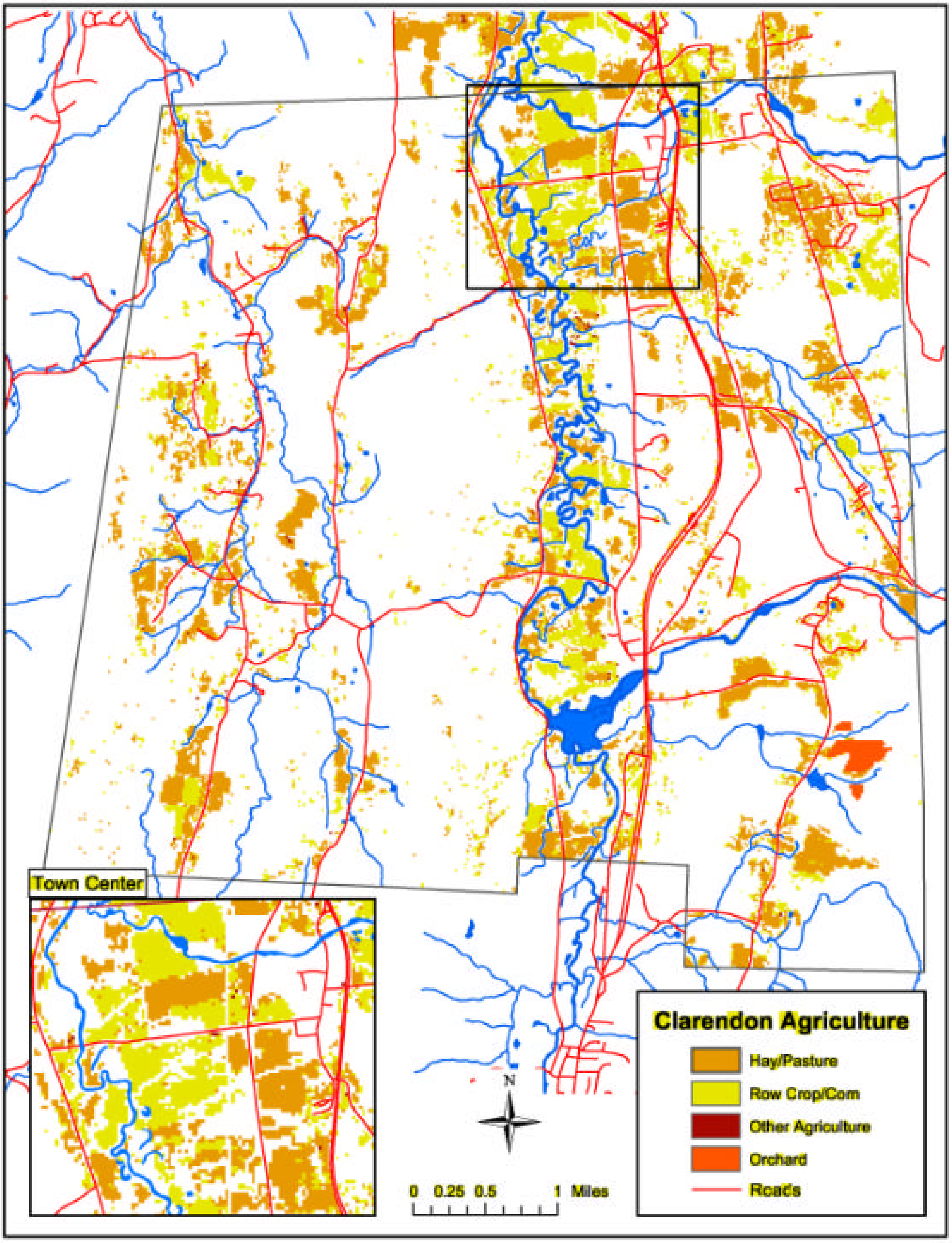
Since wind may help disperse soil-pesticide-bonded particles, it is important to understand wind patterns within the town of Clarendon. Directional data was obtained from the Rutland County Airport, indicating no wind or "calms" during 53.8% of their observations. Wind events equal to or less than 12 mph issued proportionally *from* the following directions: NW - 15.8%, NE – 3.2%, SE – 13.7%, SW – 13.5%. There appears no significant wind directional pattern in Clarendon, except a lack of flow from the northeast. It is important to note, however, that most agricultural land in Clarendon lies in a north-south orienting belt west of the town center where several of the cancer cases have been reported. The likelihood of wind dispersing dry soil particles from agricultural

land into the the town center is high since nearly 30% of wind events occur in a westerly fashion.

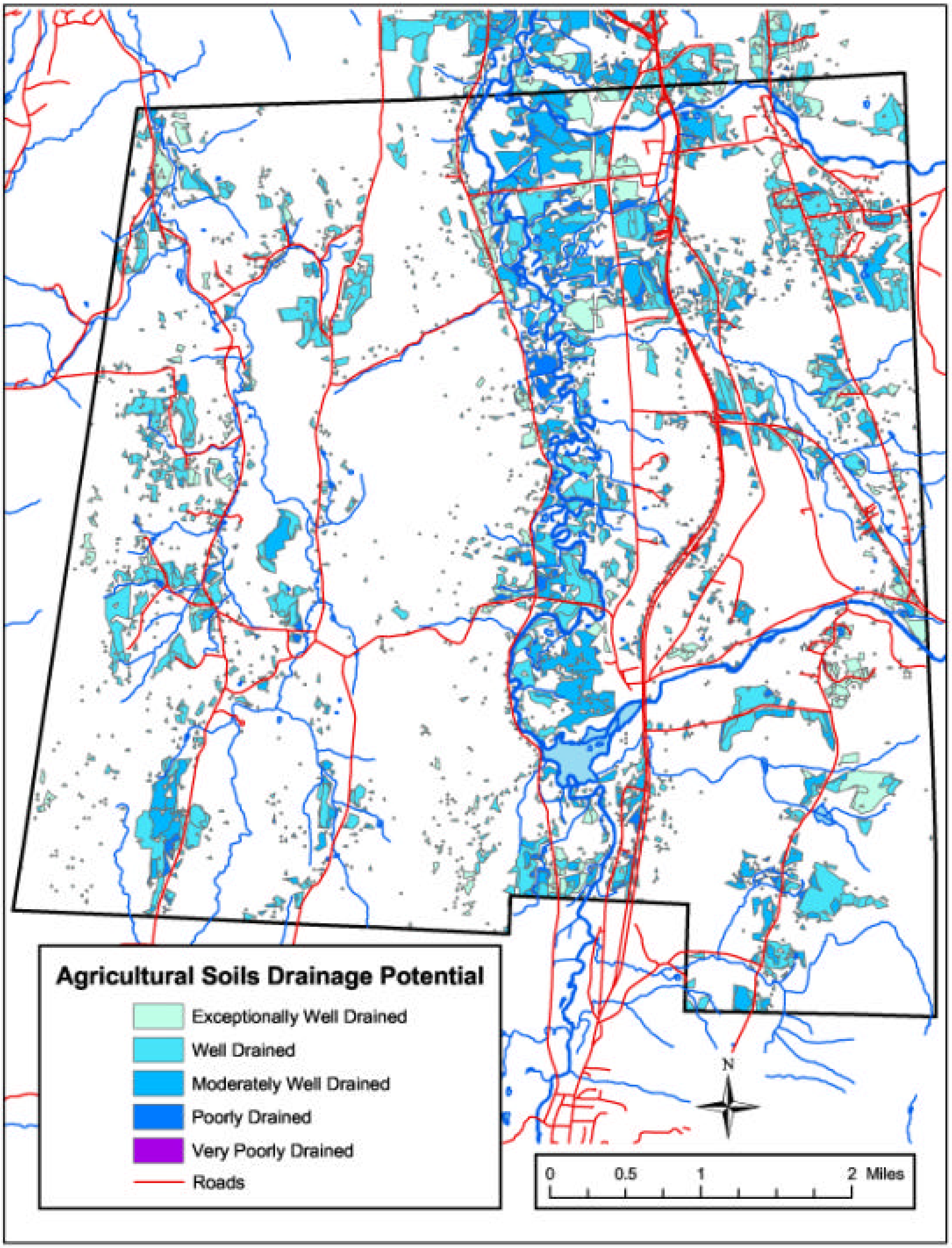
Soil pH can also affect volatilization, depending upon the pesticide's chemical properties. Map 5 displays agricultural soil pH levels for future reference.


Clarendon Land Use
Land Cover
Agricultural
Forest
Wetland
Developed
Water
Other
Roads
N
0
0.5
1
2 Miles

Map 2

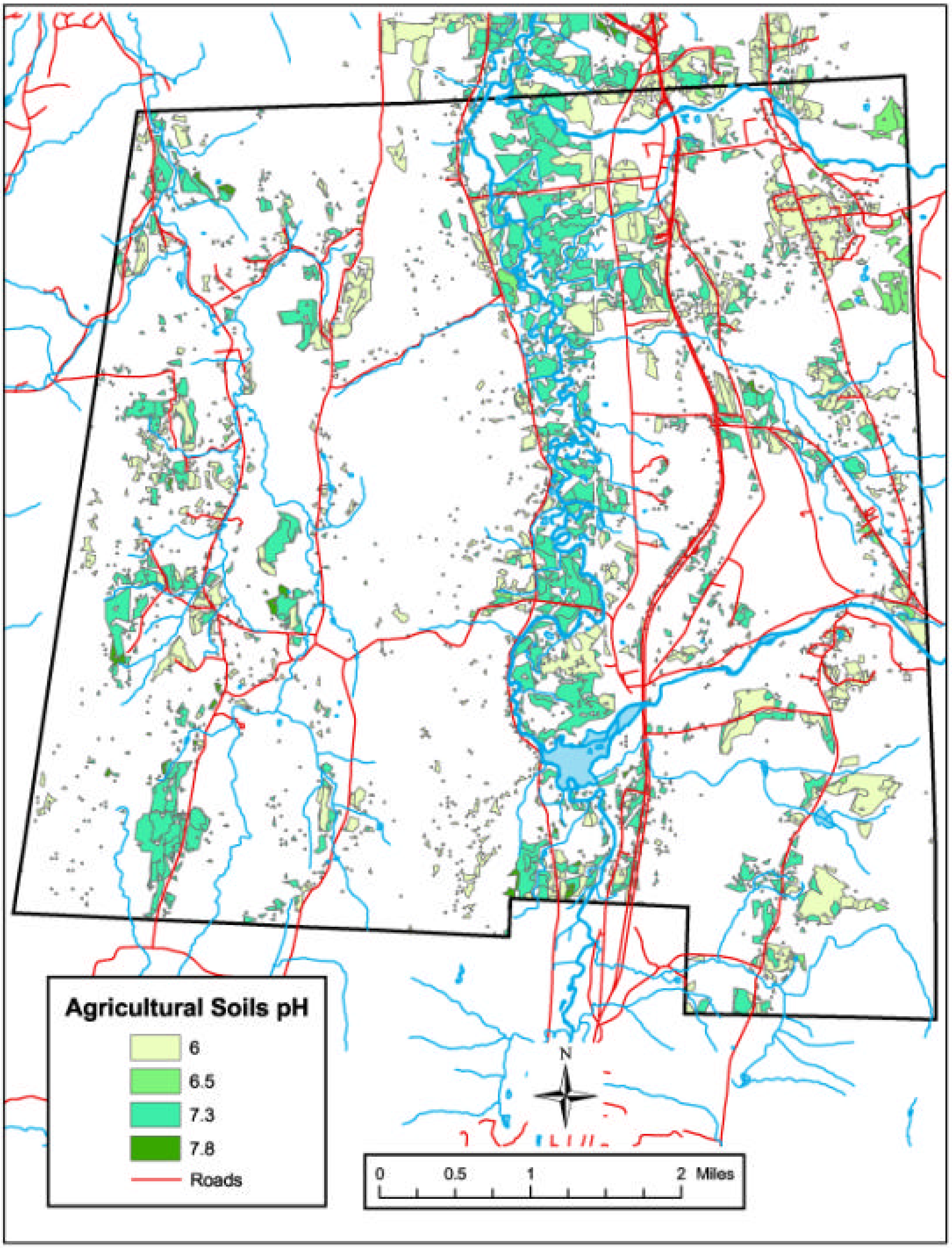

Town Center
Clarendon Agriculture
Hay/Pasture
Row Crop/Corn
Other Agriculture
Orchard
Roads
N
0 0.25 0.5 1 Miles

Map 3



Agricultural Soils Drainage Potential
Exceptionally Well Drained
Well Drained
Moderately Well Drained
Poorly Drained
Very Poorly Drained
Roads
N
0
0.5
1
2 Miles

Map 4



Map 5

Project Overview

Our work this semester provides Clarendon F.I.R.S.T. with two sets of tools: one specific to Electromagnetic Fields (EMFs), and the other to agricultural pesticides. Our overview of the literature on EMFs, as well as our data collection of background EMF levels along major roads in Clarendon, can hopefully aid Clarendon F.I.R.S.T. when deciding its future priorities. We believe EMFs emitted from power lines are highly unlikely to pose health risks. However, if Clarendon F.I.R.S.T. is committed to further investigation of EMF levels, the organization could potentially measure levels of EMFs within houses in Clarendon.

After communicating with members of Clarendon F.I.R.S.T., we were dedicated to the creation of a map indicating agricultural pesticide use in the town. Although we were unable to spatially represent pesticide use in Clarendon, we have produced an accessible overview of commonly used pesticides and their associated health risks. In addition, our basic spatial analysis of soil properties can help predict potentially volatile agricultural pesticides.

Finally, a more informal narration in Appendix 1 describes the hurdles we encountered when pursuing the pesticide section of this project. We hope that the issues and advice given will be useful for a small, community action group, such as Clarendon F.I.R.S.T., when investigating potentially sensitive topics.

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Appendices

APPENDIX A

Issues and Hurdles Gaining Pesticide Information

Due to unforeseen setbacks we were unable to spatially represent pesticide use on agricultural lands in Clarendon. This stemmed mainly from a failure to make successful contacts within our limited timeframe and inaccessibility to potentially sensitive information regarding pesticide use. The following points provide an informal list of hurdles encountered, followed by some suggestions that small community action groups such as Clarendon F.I.R.S.T. should consider when contacting governmental agencies for information.

1. *We were unable to obtain a list of farmers in Clarendon.*

Due to difficulty in establishing helpful contacts within the Vermont State Department of Agriculture, we were unable to obtain a list of farmers in Clarendon until the final week of class. Our final contact, Rick LaVitre with the University of Vermont Extension Office in Rutland, indicated that privacy issues might prevent us from obtaining a comprehensive list via mail. Obtaining such information in person might be necessary. Even he experienced situations where the bureaucratic regulations impeded efforts to gain simple data such as farmer names. Fortunately, he provided another contact, Phyllis Torrey with the Farm Service Agency in Rutland, who was able to mail us the appropriate information within a couple weeks. This list of farmers has been provided to Clarendon FIRST for future reference.

2. Records of pesticide sales and applications were inaccessible in our timeframe.

The Vermont Department of Agriculture holds records of pesticides used on commercial farms and can be obtained through a Freedom of Information Act request. We arrived at this conclusion late in the semester. Since the State's responding time of six or more weeks did not fit into our remaining time at Middlebury, we decided to conclude our search for commercial pesticide records. In addition, the Toxics Action Center in Montpelier was already in the process of obtaining the same information, and any further action seemed redundant.

Pesticide records of private farmers are not held by the State, however, necessitating local surveys on an individual basis. This process was delayed by our inability to determine the names of Clarendon farmers, and by the knowledge that the State Department of Health had already undertaken such a survey the year before. Members of Clarendon F.I.R.S.T. explained that they had not been, nor expected to be, given the results from this survey. We attempted to contact the author of the survey, but never received a response. Late in the semester we attempted to visit farmers using the pesticide survey provided in Appendix D, but without the ability to establish prior contact, our ability to find people with time to spend answering our questions was limited. We were able to talk with two individuals: one elderly man had little precise recollection of his past pesticide use, and the other needed his records to answer our questions, many of which had already been taken by the State for the aforementioned survey. It became apparent that we did not possess the necessary background, resources or time to effectively complete this survey, and concluded our attempts.

3. Clarendon lacks a tax parcel survey.

Our plan to map out agricultural lands via tax parcels, and later link these lands to pesticide application, was stymied by Clarendon's lack of a tax parcel survey due to refusal of town members to budget the necessary $40,000.

In conclusion we offer some suggestion for obtaining needed data from governmental agencies in a timely fashion:

1. *Don't rely on one "magic" contact*. If one fails, search for another. The individual we spent weeks trying to get in touch with concerning farmer names and addresses turned out not to be the most appropriate person. Avoid waiting weeks for unanswered messages and move on to alternative possibilities.

2. *Be aggressive.* If one contact refuses to grant information, try another. Eventually, you may run out of possibilities, but try as many avenues as possible before giving up.

3. *Partner with more powerful organizations.* Small citizen groups like Clarendon FIRST have more limited access to state agencies and representatives than established nonprofit organizations. Ask an organization like Toxics Action Center, for instance, to pursue potential leads, especially when dealing with a sensitive topic.

4. *Submit a Freedom of Information Act request* if important data is being withheld. Be aware that such requests can take at least six weeks to receive. Information on submitting such a form is available at the US Department of Justice's Web Site: http://www.usdoj.gov/04foia/.

APPENDIX B

Useful contacts regarding agricultural issues in Rutland County:

Rick LeVitre, Regional Dairy Specialist
University of Vermont Extension, Rutland
http://www.uvm.edu/extension/directory/southernregion/rutland.htm

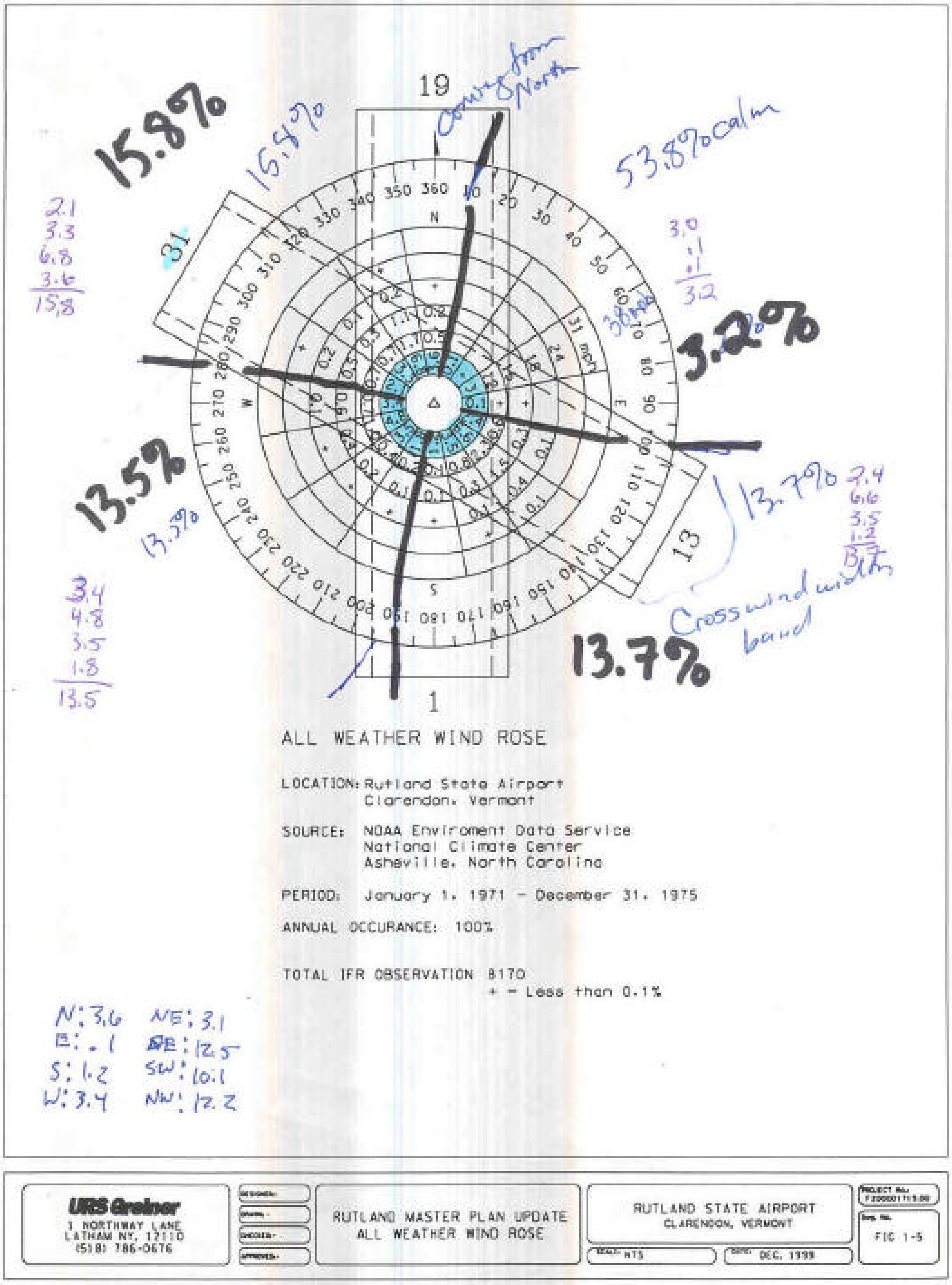
Phyllis Torey
USDA Farm Service Agency
http://www.fsa.usda.gov/VT/

Byron Moyer, Chief of Dairy Section
VT State Department of Agriculture
http://www.fda.gov/ora/fed_state/State_Directory_Files/vermont.html

APPENDIX C

Wind Rose diagram from Rutland State Airport Master Plan Update (1999) displaying percent likelihood of 12 mph wind events at specific directions (highlighted section).

Contact information: Gerry D'Amico 802-485-4735



APPENDIX D

Cause of cancer mystery in Clarendon

3/26/04
Burlington Free Press

The Associated Press

CLARENDON — A year after a group formed to investigate a possible cancer cluster in town, the causes of the problem remain murky. The state epidemiologist cautioned that such suspected clusters of illness are difficult to prove scientifically.

Wanda Crossman, one of the co-founders of Clarendon FIRST, said the group continues to focus on the town's elementary school. A community survey found an apparently high incidence of cancer among people living near the school.

Crossman's daughter Kayla was diagnosed with childhood leukemia four years ago. Next month she'll celebrate the first anniversary of the end of her chemotherapy.

"Her hair has grown back. She's very, very beautiful, very happy. Very mature. She's learned a lot," Crossman said.

Kayla is one of three Clarendon children diagnosed with leukemia in a two-year period. There have also been several cases of another blood-related cancer. Clarendon's leukemia rate over that period was roughly 15 times the national average.

Crossman said the concern about the area around the school is urgent for hers and other families.

"My biggest concern is my daughter is still attending these schools and my son goes to these schools. I want to know if they're safe," she said. "If the schools aren't safe, let's move them, let's get them out of the school."

Clarendon FIRST has been working with the state to identify potential sources of cancer-causing environmental contamination including pesticides, sludge and industrial waste.

A recently completed study by an independent consultant concluded that Clarendon's water is safe. Crossman said the state has yet to do soil and air quality tests. Her group has been pushing the state to test the air in both the elementary and high schools.

"It's been a year. We can't tell them our schools are safe yet. I feel that people are maybe becoming disappointed with us. We don't have any answers."

State epidemiologist Dr. Cort Lohff agreed that the most pressing concern is making sure there's no existing cancer threat.

APPENDIX E

Preliminary agricultural pesticide survey sent to Clarendon FIRST by Bruce Tease. This was used as the core of the attempted ES401 farmer pesticide survey described in Appendix A.

MEMORANDUM

DATE: March 11, 2004
TO: Clarendon FIRST - Jackie Fenner
FROM: Bruce Tease, ECSMarin
RE: Pesticide Survey Information

PESTICIDE SURVEY

Name: ____

Address: ____

Residential: _______________ #no. children : _______________ years living at residence:_____
Commercial: ____
Agricultural: ____
crops
____
Municipal:
____
Other:
____

Pesticide Usage:

Product Name	Powder, liquid or aerosol	When	How Much	Where	Purpose
Example: Roundup	***powder***	***June 20, 2003***	***6 ounces***	***Around garage sill***	***Ant control***

Drinking Water Source

Municipal ___________________
Private Well ___________________
Well depth ______
Age ______
Bottled Water ___________________
None ___________________
Other ___________________

Occupation
____

Years living in Clarendon: ___________________